# CRYOGENIC LIQUIDS: STORAGE, USAGE AND HANDLING

# RHIC PROJECT

## I. NON-FLAMMABLE CRYOGENIC LIQUIDS: NITROGEN, HELIUM, ARGON, NEON

A. Storage Container Requirements

1. Cryogenic liquid containers shall be double-walled with an insulating vacuum space between the inner vessel and the outer vessel which shall be provided with a burster disc or other pressure relief mechanism. Small dewars shall be made of glass while larger containers shall be metal such as stainless steel, copper or aluminum. All unprotected glass dewars shall be wrapped with heavy adhesive tape to prevent fragmentation.

2. All dewars shall be stored in well-ventilated places with the contents and responsible person identified on the label or posted nearby.

3. All containers shall be vented and vent stoppers or tubes shall be frequently inspected for plugging with ice formation.

4. Liquid nitrogen buggies shall be used exclusively to transport and store liquid nitrogen.

B. Handling and Usage

1. All body parts shall be protected against frostbite conditions when using uninsulated pipes or vessels containing cryogenic liquids.

2. Personal protective equipment shall be used as appropriate when charging a warm container or inserting or withdrawing warm objects into or out of a cryogenic liquid.

3. Operation of liquid nitrogen buggies shall be in accordance with BNL ES&H Standard 5.1.0, Appendix F.

4. In the event of a plugged dewar, the AGS Department Cryogenic Target Group or Cryogenic Safety Committee shall be contacted for plug removal.

5. Any movement of cryogenic liquids off-site shall be in compliance with DOT Regulations.

6. The design of non-flammable cryogenic handling systems shall be reviewed by the Cryogenic Safety Committee.

C. Operating Instructions and Log

1. A Maintenance Log shall be maintained within the Project for all dewars with a capacity of 100 liters or larger. The Maintenance Log is located in the office of the RHIC Project Cryogenics Group Technical Supervisor and indicates a responsible individual, date and quantity of filling, type of contents, status of the insulating vacuum and/or boil off rate and any corrective actions taken.

2. Schematics and operating instructions for Project cryogenic systems shall be posted adjacent to equipment indicating: a responsible individual, date and quantity of filling, type of contents, status of the insulating vacuum and/or boil off rate and any corrective actions taken.

3. The Supply and Materiel Division shall provide the maintenance and repair of liquid nitrogen buggies.

## II. FLAMMABLE CRYOGENIC LIQUIDS: HYDROGEN, OXYGEN

A. Storage Requirements

1. The AGS Department Cryogenic Target Group shall regulate deliveries and maintain a Log of systems approved by the Cryogenic Safety Committee for receipt of these materials. The Log is located in the Cryogenic Target Group Office in Building 919A.

2. Liquid hydrogen received at the Laboratory shall be vendor certified as Specification: MIL-P-27201 Propellant Hydrogen DOD 1971 and shall meet the requirements of NFPA Standard No. 50B and BNL ES&H Standard 5.2.0.

3. On-site transportation of flammable cryogenic liquids shall be in accordance with BNL ES&H Standard 5.2.0, Section VII.

B. Handling and Usage

1. The Project Supervisor or designer of new or modified flammable cryogenic liquid systems shall submit documentation of system design for review by the Cryogenic Safety Committee and approval by the Associate Director for Safety prior to installation or construction.

2. The Project Supervisor or designer shall obtain S&EP Division review of all completed or modified installations prior to the introduction of flammable cryogenic liquid. The S&EP Division shall issue a Safety Review Sticker verifying approval by the Cryogenic Safety Committee in accordance with BNL ES&H Standard 5.2.0, Appendix A.

3. Unauthorized personnel shall be prohibited from entry by a physical barrier and posting that indicates the specific flammable cryogenic liquid in use at all access points.

4. Only cryogenic equipment operators trained and qualified in accordance with BNL ES&H Standard 5.2.0, Sections V.E and VI.D shall be authorized in areas where flammable cryogenic liquids are present.

5. Liquid oxygen shall be handled in accordance with NFPA Standard 50 Bulk Oxygen Systems, Factory Mutual Loss Prevention Data Sheet 7-52 Oxygen, and BNL ES&H Standard 5.2.0 Section VI.

## III. TRAINING

A. Line Supervisors shall ensure that their employees are trained and qualified to handle the cryogenic liquids which they use.

Satoshi Ozaki 8/8/97

**APPROVED** _____ **DATE** _____

**RHIC Project Head**